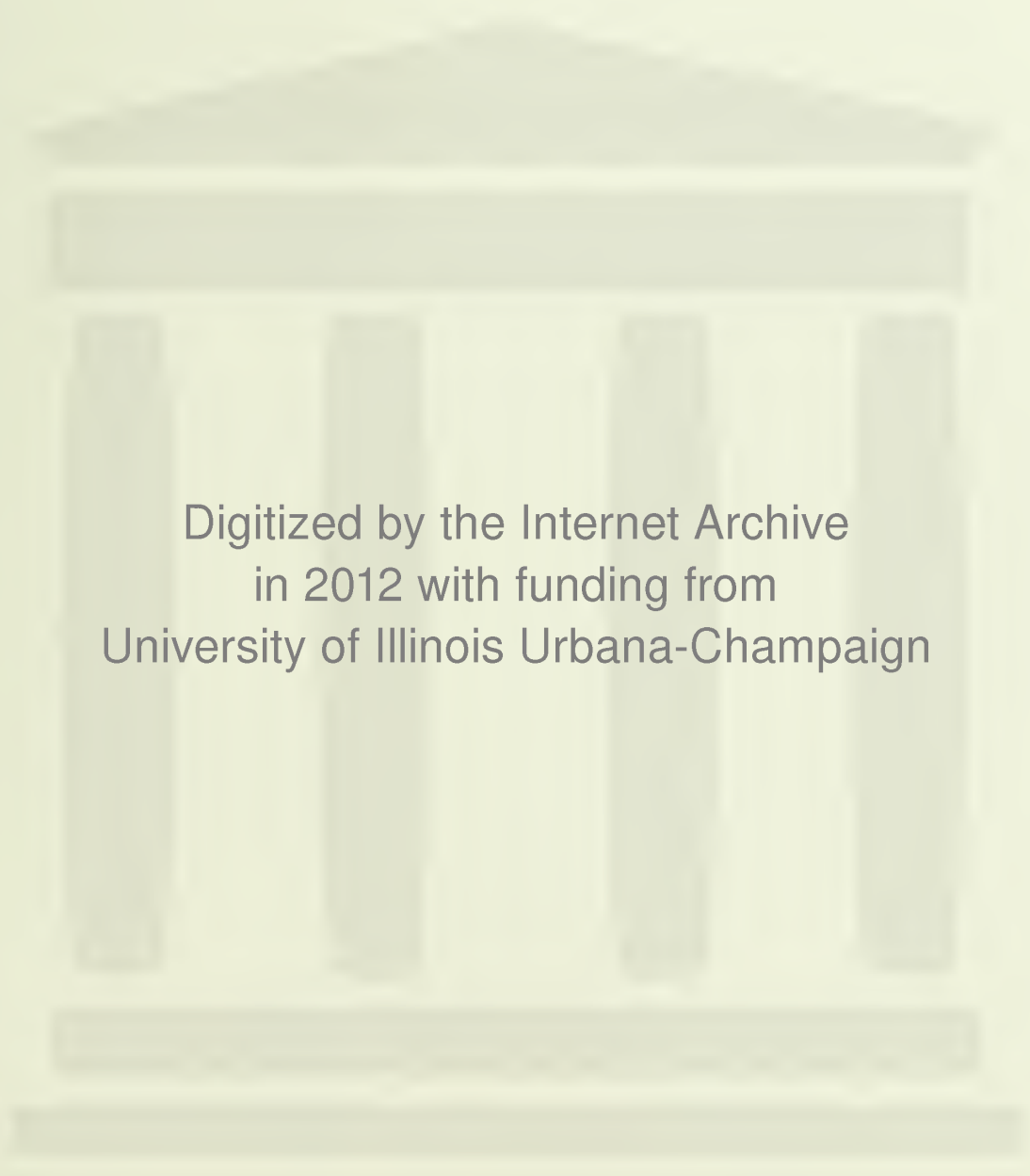






UNIVERSITY OF  
ILLINOIS LIBRARY  
AT URBANA-CHAMPAIGN  
BOOKSTACKS



Digitized by the Internet Archive  
in 2012 with funding from  
University of Illinois Urbana-Champaign



330  
B385  
1993:152 COPY 2

STX

THE LIBRARY OF THE

SEP 22 1993

UNIVERSITY OF ILLINOIS  
URBANA-CHAMPAIGN

# Absolute and Proportional Sensitivity in New Product Introduction Decisions

***Jose Antonio Rosa***

*Department of Business Administration  
University of Illinois*

***William J. Qualls***

*Alfred P. Sloan School of Management  
Massachusetts Institute of Technology*

***David P. Wooten***

*School of Business  
Columbia University*



# BEBR

FACULTY WORKING PAPER NO. 93-0152

College of Commerce and Business Administration

University of Illinois at Urbana-Champaign

August 1993

## Absolute and Proportional Sensitivity in New Product Introduction Decisions

Jose Antonio Rosa  
William J. Qualls  
David P. Wooten





**ABSOLUTE AND PROPORTIONAL SENSITIVITY IN  
NEW PRODUCT INTRODUCTION DECISIONS**

by

JOSE ANTONIO ROSA  
Assistant Professor  
College of Commerce and Business Administration  
University of Illinois at Urbana-Champaign  
Champaign, IL 61820  
(217) 333-5160

WILLIAM J. QUALLS  
Associate Professor  
Alfred P. Sloan School of Management  
Massachusetts Institute of Technology  
50 Memorial Drive E53-409  
Cambridge, MA 02139  
(617) 253-0492

DAVID P. WOOTEN  
Assistant Professor  
Columbia University  
School of Business, 520 Uris Hall  
New York, NY 10027  
(212) 854-4221

Correspondence should be sent to Jose Antonio Rosa, College of Commerce and Business Administration, University of Illinois at Urbana-Champaign, 350 Commerce West, 1206 South Sixth St. Champaign, IL 61820. Phone: 217-333-5160. Fax: 217-244-7969



### **Abstract**

This study examines the effects of Decreasing Absolute Sensitivity (DAS) and Increasing Proportional Sensitivity (IPS) effects on decision making in the context of new product introductions. DAS effects suggests that when comparing two-attribute alternatives (dollar value and time or marginal probability) with different time horizons or marginal probabilities, increasing the dollar value of each alternative by a common factor will reduce the importance of the value attribute and focus more of the decision makers attention on the time or probability attribute. IPS effect suggests that when comparing two-attribute alternatives with different time horizons or marginal probabilities, multiplying the dollar value of each alternative by a common factor greater than one will increase the importance of the value attribute relative to other attributes. Both effects are violations of the Discounted Utility Model of decision making for alternatives expressed in terms of dollar and time attributes, and of the Expected Utility Model for alternatives expressed in terms of dollar and marginal probability attributes. The study also looks at how group discussion of the problem situation impacts the DAS and IPS effects.

The study uses a 3x2 across-subjects experimental design. Respondents were all exposed to a complex new product introduction decision based on a case study and asked to choose one of the three two-attribute alternatives available at the end of the case. Dollar value was set at control levels, increased by a common factor (DAS effect), and multiplied by a common factor (IPS effect). The non-dollar attribute was varied between time and marginal probabilities. Results show that DAS and IPS effects can affect new product introduction decisions and that group discussion of the problem situation did not attenuate the DAS and IPS effects appreciably.

**Key Words:** Decision Making: New Product, Heuristics, Intertemporal, Uncertainty

## **Introduction**

The expected utility and discounted utility models have been cornerstones in the development of marketing management theory since its inception as a field of study. Both models view marketing decision makers as selecting between alternatives or prospects based on weighed sum of benefits or outcomes, with the weights being either probabilities (for the expected utility model) or discount rates over time (for the discounted utility model). The appeal of these models to marketers is in their simplicity and in their presenting the manager as a rational utility maximizer capable of optimal decisions. The expected utility model, following the axioms of von Neumann and Morgenstern (1953), underlies most of the marketing decision models found in the literature (e.g., Wilson, Weiss, and John 1990), while derivations of Koopmans (1960) discounted utility model are behind popular product and business portfolio management models (e.g., Day and Fahey 1988).

Violations of both the expected utility and discounted utility models have been documented, however, in marketing and other decision contexts. In marketing, for example, we find organizational buyers are affected by the framing of decisions (Puto 1987), a violation of expected utility models that is also well documented in the psychology literature (Kahneman and Tversky 1979). We also find that product managers do not discount cash flow information properly when planning their strategies (e.g., Cosse and Swan 1983). Expected utility violations in other decision contexts have been methodically reviewed and made the focus of scholarly attention (e.g., Weber and Cramer 1988). Discounted utility violations have received somewhat less attention, but have also been systematically reviewed and summarized (Lowenstein and Prelec 1992).

The violation of expected utility in marketing managerial decision making is an important area of research, as evidenced by the use of prospect theory to explain



managerial behavior (e.g., Qualls and Puto 1989). Violations of discounted utility are also receiving some attention through attempts at providing theoretical explanations for their occurrence (Mowen and Mowen 1991). Research in both areas has been further benefited by the introduction of a model of decision making that helps explain violations of both the expected utility and discounted utility models within a single framework and is empirically testable (Prelec and Lowenstein 1991).

### **An Integrated Model of Choice Decisions Over Time and Under Uncertainty**

The integrated model proposed by Prelec and Lowenstein (1991) begins with two basic premises similar to those underlying the expected utility and discounted utility models. The first is that in choice between alternatives, the prospects are evaluated using multiple attributes (e.g., the time interval and dollar value of each alternative). The second is that the weight or importance (psychological salience) of each attribute is affected by its magnitude. More specifically, the overall importance of an attribute decreases as its magnitude decreases. In its treatment of magnitude, however, this model digresses from a classical treatment of utility because it focuses on the *ratio of the magnitude of attributes between prospects* instead of their absolute magnitude. For example, the model focuses on the ratio of the dollar value of prospects being compared instead of on their absolute dollar value. Comparing attribute magnitude across prospects suggests two distinct effects.

#### Decreasing Absolute Sensitivity

The first effect is Decreasing Absolute Sensitivity (DAS) and is captured by the expression:

$$\frac{f(a_2)}{f(a_1)} \leq \frac{f(a_1 + \text{constant})}{f(a_2 + \text{constant})} \leq \frac{f(a_1)}{f(a_2)} \quad (\text{if constant} \times (a_x) > 0)$$

where  $a_1$  and  $a_2$  are attributes of a generic two attribute prospect  $(a, b)$  and  $f(a_1)$  is a transformation of the first attribute.

It suggests that changing the absolute value of an attribute by a common additive constant will move the ratio  $f(a_1)/f(a_2)$  toward a value equal to one, and as that happens the salience of that attribute will decrease. Consider for example, a product manager that is ambivalent between the two product introduction strategies illustrated below:

		US market				European market			
	Value	\$140				\$180			
Alternative 1		+=====+							
	Month	0	1	2	3	4	5	6	7
	Value		US market					European market	
			\$160					\$190	
Alternative 2		+=====+							
	Month	0	1	2	3	4	5	6	7

Alternative 1 provides a value of \$140 immediately and \$180 in month 4, while Alternative 2 has a value of \$160 in month 1 and \$190 in month 6. The DAS model suggests that increasing the value of all income opportunities by a common factor (e.g., \$5000) will reduce the importance of the dollar value attribute relative to that of time, and that the manager will prefer Alternative 1 because of its shorter time horizon. This is a violation of the integration principle for temporal prospects assumed by the discounted utility model. The integration principle is a fundamental assumption of both expected utility and discounted utility models. It states that changes in wealth (e.g., changes in the value of alternatives) are integrated by decision makers into existing levels of wealth and do not alter discount rates used to evaluate alternatives initially. In other words, the discount factor implicit by being ambivalent between the two original alternatives should not change as the magnitude of the income stream changes.

### Increasing Proportional Sensitivity

The second effect is the Increasing Proportional Sensitivity (IPS) effect and is captured by the following expression:

$$\frac{f(a_2)}{f(a_1)} \leq \frac{f(a_1/\text{constant})}{f(a_2/\text{constant})} \leq \frac{f(a_1)}{f(a_2)} \quad (\text{if constant } X(a_x) > 0 \text{ and constant } X \neq 1)$$

with  $f(a_i)$  once again being a transformation of the first attribute of a generic two attribute prospect  $(a, b)$ .

It suggests that changes to the absolute value of an attribute by a moderately-sized common proportional factor greater than one will move the ratio  $f(a_1)/f(a_2)$  away from a value equal to one, and as that happens the salience of that attribute will increase. The common factor is limited to moderate size because very large proportional increases are likely to trigger risk averse behavior (i.e., people ambivalent between \$1000 now and \$2000 in three months become risk averse if the amounts become \$10 million and \$20 million respectively). As an example of the IPS effect, consider once again our product manager, now ambivalent between the two product introduction strategies illustrated below:

		US market				European market			
	Value	\$200				\$300			
Alternative 1		+=====+							
	Month	0	1	2	3	4	5	6	7
		US market				European market			
	Value	\$300				\$500			
Alternative 2		+=====+							
	Month	0	1	2	3	4	5	6	7

Alternative 1 provides a value of \$200 immediately and \$300 in month 4, while Alternative 2 has a value of \$300 in month 1 and \$500 in month 6. The IPS model suggests that multiplying the value of all income opportunities by a common factor (e.g.,

100) will increase the importance of the dollar value attribute relative to that of time, and that the marketer will prefer Alternative 2 because of its higher dollar value. This corresponds to the magnitude effect documented by Benzion, Rapoport, and Yagil (1989). This is also a violation of the integration principle for temporal prospects.

#### DAS and IPS effects for Decision Under Uncertainty

The integrated model of choice also suggests that DAS and IPS effects are applicable when alternatives are expressed in terms of dollar values and probabilities. For example, assume the product manager is ambivalent between these two new product introduction strategies:

**Alternative 1:** A strategy that results in the US market having income potential of \$850 with probability of .75 and the European market having income potential of \$730 with probability of .60.

**Alternative 2:** A strategy that results in the US market having income potential of \$850 with probability of .55 and the European market having income potential of \$760 with probability of .80.

The DAS model suggests that increasing the value of all income opportunities by a common factor (e.g., \$5000) will reduce the importance of the dollar value attribute relative to that of the probabilities, and the marketer will prefer Alternative 1 because of its slightly higher marginal probability. This is a violation of the integration principle for decisions under uncertainty because the present values of the alternatives should remain equal to each other even as the magnitude of the income stream changes. The IPS model suggests that multiplying the value of all income opportunities by a common factor (e.g., 100) will increase the importance of the dollar value attribute relative to that of time, and that the marketer will prefer Alternative 2 because of its higher face dollar value. This is again a violation of the integration principle for decisions under uncertainty.



The Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects have important implications for new product introduction decisions. We saw in the example that the manner in which the dollar value of a potential market is adjusted and presented can result in different decisions. If the adjustment is expressed as a lump sum added to all alternatives (e.g., increase all alternatives by \$10 million) it can reduce the salience of the dollar value attribute relative to time, while if the adjustment is expressed as a proportional adjustment (e.g., increase all alternatives by 40%) it can increase the salience of the dollar value attribute. The same effects are possible in other timing decisions (e.g., advertising and promotional programs, sales incentive programs) as well. The DAS and IPS effects can also affect policy decisions. One possible effect of DAS is that as the overall value of decision prospects increases, managers actually become less sensitive to the dollar value attribute relative to other attributes if the ratio of the prospect valuations moves closer to 1. It is possible, therefore, that when deciding between two strategic alternatives worth \$4,500,000 and \$5,000,000 respectively, the dollar value attribute will receive less attention than when deciding between alternatives worth \$500,000 and \$1,000,000 respectively. This might help us understand why managers sometimes spend inordinate amounts of time deciding on small investments while at the same time committing the firm to major expenditures with relatively little consideration.

Based on the implications of the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects for marketing decision making and our limited general understanding of violations of expected utility and discounted utility, it seems these effects should be tested in the context of marketing decisions. It also seems important to investigate if these effects are found even when the prospects are discussed and evaluated in group settings. Prelec and Lowenstein present their model as an individual-level heuristic, and their examples are all of personal decisions (choosing between gambles or

between payback schedules). Since many marketing decisions are made by groups, however, it is important to test for these effects for decisions which follow group discussions as well as for strictly individual-level decisions. For this reason we decided to test the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects on a realistic marketing problem (new product introduction timing) and to ask respondents to make choices both before and after an extensive group analysis of the situation.

### **Methodology**

We wanted to test the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects in the context of a complex and realistic marketing situation, and designed an experiment using a case scenario. The intent was to place respondents in a marketer's role involving new product introduction timing decisions and to manipulate the options presented to establish a base or control condition, a Decreasing Absolute Sensitivity (DAS) condition, and an Increasing Proportional Sensitivity (IPS) condition. The DAS condition would add a constant amount to the value of each option, while the IPS condition would multiply the value of each condition by a constant.

The case used is the Introduction of Microsoft Works (Harvard Business School, case no. 9-588-028, 1987). This case concerns the introduction of Microsoft Works software to the US and European markets and leaves the marketing manager with three options which differ in terms of their dollar value and timing. The case is ambiguous enough to allow all the necessary manipulations of the dollar values to appear realistic. It also allows us to summarize the options in terms of both time intervals and stochastic outcomes. Consequently, we used the same scenario to test Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects on both a decision under uncertainty and an intertemporal choice decision. For each decision type (intertemporal or uncertainty), three realistic conditions were created: a base condition, a DAS condition in

which all money values were increased by \$5 million, and an IPS condition in which all dollar values were multiplied by 10. The base condition was necessary to establish a benchmark from which the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects could be tested. In typical case fashion, this situation had other factors (other than dollar value and timing or probabilities) that entered into the decision, and not all options were equally attractive. Although respondents could adopt different strategies depending on their assumptions and which elements of the case they considered most important, the case favored the introduction of the US version in September and the European version in February (Option 2 in the first exercise). We expected an unequal distribution under the base condition in favor of this option. By establishing a distribution of choices for the base condition, we could then operationalize our propositions for the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects as variations from this benchmark. The choices of respondents under a total of six conditions were examined (intertemporal base, DAS, and IPS; uncertainty base, DAS, and IPS) and each respondent chose twice (before and after group discussion). Both times we had nineteen respondents assigned to each condition for a total of 114.

The respondents were MBA students enrolled in a Marketing Management course at a large university. The average age of the respondents was 25 years old, they had an average of 2.6 years of work experience, and 71 % were male. The average GMAT score was 597. Although they were not all highly experienced managers, they had analyzed a large number of cases in their courses already and were familiar with decision making techniques like discounted cash flow and expected value calculations. It seems reasonable to think their decisions would not vary significantly from those of marketing managers if faced with the same situation. The case was assigned as a written assignment to be completed by groups at the end of the semester. Five weeks before the written assignment

was due, respondents were asked to read the case in preparation for the project and were given the first questionnaire under the pretense of verifying their having read the case. They were advised it was not necessary to discuss the case with their groups and were given little time for discussion. The questionnaire asked them to choose from one of three options. The typical intertemporal and uncertainty options had the following formats:

**Intertemporal option:** Introduce Works in the US in September and in Europe in October without new features. Revenue from US sales of \$1,170,000 starting in September and from international sales of \$429,600 starting in October.

US	Intl.					
\$1,170.0	\$429.6					
+-----+	+-----+	+-----+	+-----+	+-----+	+-----+	
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	

**Decision under uncertainty option:** Introduce Works in the US in September and in Europe in October without new features. Revenue from the US market of \$950,000 with .85 probability (.15 probability of \$0 revenue) and \$529,800 from other market with .50 probability (.50 probability of \$0 revenue).

The options differed in terms of the revenue involved and the time interval or probabilities listed. The second questionnaire was administered five weeks after the first, once respondents had turned in the written assignments. They were once again asked to choose from one of three options presented in the same format. The order in which the options were listed was changed from the first questionnaire to reduce the chance of responses based on consistency with the first-time choice. Respondents were separated into two groups; one group had only intertemporal decisions, and the other had only decisions under uncertainty. No attempt was made, however, to have the respondents face the same condition (base, DAS, or IPS) both times. Extensive debriefing of respondents revealed they were not aware of the purpose of the research after the first or second questionnaire, and could not remember clearly enough the first questionnaire to detect the manipulations in the second questionnaire.



The data were analyzed using two procedures. First, we coded each option as a binary variable (0 = not chosen, 1 = chosen). Each respondent was also given a categorical condition variable (-1 = DAS condition, 0 = base condition, 1 = IPS condition). We used cross tabulations with the option choice as the dependent variable (columns) and condition as the independent variable (rows) to calculate the proportion of respondents choosing each option for each condition. The second procedure was a logistic regression with the option choice as the dependent variable and condition as the independent variable. The categorical condition variable was transformed into a pair of dummy variables which took on different values depending on the condition. Under the DAS condition the values were Dummy 1 = .667 and Dummy 2 = -.333. Under the IPS condition the values were Dummy 1 = -.333 and Dummy 2 = .667. For the base condition the values were: Dummy 1 = -.333, Dummy 2 = -.333. Note this is equivalent to having Dummy 1 equal to one for the DAS condition and zero otherwise and Dummy 2 equal to one under the IPS condition and zero otherwise, with both being zero under the base condition. The logistic regression model estimated the likelihood of each option being chosen as a function of the DAS and IPS condition relative to the base condition.

### **Expected Effects for the First Set of Decisions and Results**

As discussed earlier, changes to the absolute value of the prospect valuation is expected to change the salience of the money dimension relative to that of the time or probability dimensions. Under the DAS condition, we expected the importance of the money dimension to decrease as the absolute value of the income was increased by an additive constant. Under the IPS condition, we expected the importance of the money dimension to increase as the absolute value of the income was increased by a proportional constant. Option 1 for both intertemporal and uncertainty decisions in all three conditions are listed in Table 1. Note for the DAS condition each value was increased by \$5 million

(e.g., option 1 values become \$6,170.0 and \$5,429.6 for the intertemporal decision, and \$5,950,000 and \$5,529,800 for the uncertainty decision in the first exercise). For the IPS condition, each value was multiplied by 10 (e.g., option 1 values become \$11,700.0 and \$4,296.0 for the intertemporal decision and \$9,500,000 and \$5,298,000 for the uncertainty decision). All options for all decision types and conditions are included in the Appendix. Please keep in mind the same options were used for both exercise and only their order of presentation was changed for the second exercise.

-----  
Insert Table 1 about here.  
-----

Based on the proposed effects, we expected for the first set of intertemporal decisions:

**Proposition 1:** Option 1 will be chosen by a higher proportion of respondents under the DAS condition relative to the base condition because the time dimension will be more important, and this option has the shortest time horizon.

**Proposition 2:** Option 2 will be chosen by a higher proportion of respondents under the IPS condition relative to the base condition because the money dimension will increase in importance, and this option has the highest dollar value.

**Proposition 3:** Option 3 will be chosen by a lower proportion of respondents under both the DAS and IPS conditions relative to the base condition because this option is at a time disadvantage to option 1 and a dollar value disadvantage to option 2.

Following the same reasoning, we expected for the first set of decisions under uncertainty:

**Proposition 4:** Option 1 will be chosen by a lower proportion of respondents under the DAS condition relative to the base condition because the probability dimension will go up in importance, and this option has the lowest marginal probability.

**Proposition 5:** Option 2 will be chosen by a higher proportion of respondents under the DAS condition relative to the base condition because the probability dimension will go up in importance, and this option has the highest marginal probability.

**Proposition 6:** Option 3 will be chosen by a higher proportion of respondents under the IPS condition relative to the base condition because the money dimension will go up in importance, and this option has the highest dollar value.

-----  
Insert Table 2 about here.  
-----

Results of the first set of intertemporal and uncertainty decisions are summarized in Table 2. The proportion of respondents choosing each option under each condition for the intertemporal decisions were all in the expected direction although the differences were not significant. In support of proposition 1 we find that option 1 was chosen by 7/19 (36.8%) of respondents under the DAS condition and 4/19 (21.7%) under the base condition. The odds of option 1 being chosen under the DAS condition were 2.0 times higher than under the base condition. As it pertains to proposition 2, we find that option 2 was chosen by 12/19 (63.2%) of respondents under the IPS condition and by 10/19 (52.6%) under the base condition. The odds of option 2 being chosen under the IPS condition were 1.5 times higher than under the base condition. Finally, option 3 was chosen by 3/19 (15.8%) of respondents under both the DAS and IPS conditions, and by 5/19 (26.3%) under the base condition in support of proposition 3. The odds of option 3 being chosen under both conditions were .5 times the odds under the base condition. As expected, a larger proportion of respondents (54.4%) chose option 2, relative to option 1 (26.3%) and option 3 (19.3%). This is the option favored by other data in the case.

For the decisions under uncertainty, the distribution of respondents across the different conditions for two of the three options were also in the expected direction, and

one of the differences was close to significant. Option 2 was chosen by 15/19 (78.9%) of respondents under the DAS condition, by 8/19 (42.1%) under the base condition, and by 11/19 (57.9%) under the IPS condition (chi-square = 5.39386,  $p = .06741$ ). The logistic regression model was also close to significant (model chi-square 5.598,  $p = .0609$ ), and the individual coefficient estimates show it was the DAS condition that was significant (Wald statistic = 5.0514,  $p = .0264$ ). The odds of option 2 being chosen under the DAS condition were 5.2 times higher relative to the base condition. These results support proposition 5. As it pertains to proposition 4, option 1 was chosen by 3/19 (15.8%) under the DAS condition and by 6/19 (31.6%) under the base condition. This difference was not significant but in the right direction. The odds of option 1 being chosen under the DAS condition were .4 times the odds under the base condition. For proposition 6 the results were contrary to what we expected. Option 3 was chosen by 3/19 (15.8%) of respondents under the IPS condition and 5/19 (26.3%) under the base condition. Although option 3 had a higher dollar value than the base condition, it appears other factors in the case caused respondents to discount the higher dollar value and actually move away from option 3 under the IPS condition. Some respondents moving away chose option 2 which has a slightly lower dollar value but higher marginal probability. As expected, option 2 was the chosen by 59.6% of respondents, compared to 24.6% choosing option 1 and 15.8% choosing option 3.

### **Expected Effects for the Second Set of Decisions and Results**

The manner in which Prelec and Lowenstein presented the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects on intertemporal decisions or decisions under uncertainty did not address the question of how the intense scrutiny of the situation would affect how individuals respond to the different conditions. Their mathematical representation of the process, however, suggests it is a heuristic applied by



persons regardless of their level of familiarity with the situation. Consequently, we expect the second set of intertemporal decisions to produce the following results based on their model. These propositions mirror propositions 1-6 except for a change in the order of the options.

**Proposition 7:** Option 1 (same as option 2 in the first decision exercise) will be chosen by a higher proportion of respondents under the IPS condition relative to the base condition.

**Proposition 8:** Option 2 (same as option 3 in the first decision exercise) will be chosen by a lower proportion of respondents under both the DAS and IPS conditions relative to the base condition.

**Proposition 9:** Option 3 (same as option 1 in the first decision exercise) will be chosen by a higher proportion of respondents under the DAS condition relative to the base condition.

For the second set of decisions under uncertainty we expect the following:

**Proposition 10:** Option 1 (same as option 2 in the first decision exercise) will be chosen by a higher proportion of respondents under the DAS condition relative to the base condition.

**Proposition 11:** Option 2 (same as option 3 in the first decision exercise) will be chosen by a higher proportion of respondents under the IPS condition relative to the base condition.

**Proposition 12:** Option 3 (same as option 1 in the first decision exercise) will be chosen by a lower proportion of respondents under the DAS condition relative to the base condition.

An alternative perspective is that more intense study of a situation will cause decision makers to consider more than the comparison of simple ratios between the different options and virtually eliminate their reliance on heuristics that can lead them to the wrong decision. As mentioned earlier, the case used for this experiment gave the readers considerably more information than the simplified options listed in the questionnaire, and thorough analysis of case information should lead respondents to

choose the introduction of the US version in September and the European version in February (Option 2 in the first exercise) for strategic reasons other than timing or stochastic considerations. Given that at the time of the second decision the respondents had spent considerable time preparing written recommendations (the assignment counted for 25% of their final grade in the course), we can expect all respondents to have a much more in-depth understanding of the situation and to base their choices on that deeper level of understanding. Consequently, if intense scrutiny eliminates reliance on heuristics, we should see respondents choosing the option just described across all conditions. For the second set of decisions this is Option 1.

The results for both the second exercise intertemporal and uncertainty decisions are also summarized in Table 2. For the intertemporal decisions, the distribution of respondents across the different conditions for two of the three options were in the direction predicted by the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects, and one of the differences was close to significant. As it pertains to proposition 7, option 1 was chosen by 14/19 (73.7%) of respondents under the IPS condition, by 7/19 (36.8%) under the base condition, and by 8/19 (42.1%) under the DAS condition. The larger proportion choosing option 1 under the IPS condition was significant (chi-square = 6.03695,  $p = .04888$ ). The logistic regression model was close to significant (model chi-square = 6.379,  $p = .0946$ ) and the IPS condition coefficient was highly significant (Wald statistic = 4.8008,  $p = .0284$ ). The odds of option 1 being chosen were 4.7 times higher under the IPS condition relative to the base condition. For proposition 8, option 2 was chosen by 4/19 (21.1) of respondents under the base condition, by 3/19 (15.8%) under the DAS condition, and by 2/19 (10.5%) under the DAS condition. This was obviously the least popular option across all conditions and the difference in the proportions choosing it across conditions are not significant, although

they are in the expected directions. For proposition 9, option 3 was chosen by 8/19 (42.1%) of respondents under the DAS and base conditions. Since we expected to have higher proportion under the DAS condition, the proposition has no support. Once again we find a larger proportion of respondents (50.9%) choosing the same option (Option 1 for the second exercise) relative to the other two options (option 2 = 15.8%; option 3 = 33.3%). It is interesting, however, that not all respondents chose Option 1 as we would have expected if the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects were eliminated by more in-depth knowledge of the situation. It is also interesting that there was significant correlation between what respondents chose the first time and what they chose the second time. Although we find a similar proportion of respondents choosing this option for both the first and second exercise, it was not the same people choosing it both times.

For the decisions under uncertainty, the distributions for two options were in the expected direction, although neither was significant. Concerning proposition 11, option 2 was chosen by 2/19 (10.5%) of respondents under the IPS condition and 0/19 (0.0%) under the base condition. This was by far the least popular option across all conditions, but the distribution of how often it was chosen across conditions was as expected. On proposition 12, option 3 was chosen by 6/19 (31.6%) under the DAS condition, by 8/19 (42.1%) under the base condition, and by 4/19 (21.1%) under the IPS condition. When either the money or probability dimension was made more salient, this option was favored less because it was at a disadvantage. Finally, for proposition 10 we find that option 1 was chosen by 12/19 (63.2%) of respondents under the DAS condition, by 11/19 (57.9%) under the base condition, and by 13/19 (68.4%) under the IPS condition. This proposition received no support. Again we find this option favored (option 1 = 63.2%) over the other two options (option 2 = 5.3%; option 3 = 31.6%), but with no significant correlation

between the persons choosing it for the first exercise and those choosing it for the second exercise.

One possible confounding variable was demand effects created by the condition being the same for both the first and second decision exercise. As mentioned earlier, no attempt was made to control the condition between exercises, only the type of decision (intertemporal or uncertainty). A total of 46 respondents had the same condition for both the first and second exercise, while 68 had a different condition. These groups were segregated and their first exercise and second exercise choices were correlated. For the group with the same condition for both exercises, the Spearman correlation coefficient was .3384 ( $p = .021$ ), which suggests demand effects might be a problem. For the group with different conditions there was no significant correlation (Spearman coefficient = .0742,  $p = .548$ ). Demand effects did not seem to be a problem for this group, and it seemed sensible to reanalyze this group's second set of decisions for Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects as was done for the whole sample. The expectations were the same as those listed as propositions 7 - 9 for intertemporal decisions and propositions 10-12 for decisions under uncertainty. The results are summarized in Table 3. Note the distribution patterns are similar to what was found in the total sample.

-----  
Insert Table 3 about here.  
-----

For the intertemporal decisions, we find that option 1 was chosen by 8/12 (66.7%) of respondents under the IPS condition, 2/11 (18.2%) under the base condition, and 3/8 (37.5%) under the DAS condition. Although the logistic regression model as a whole was not significant (model chi-square = 5.896,  $p = .1168$ ), the IPS condition was significant



(Wald statistic = 4.9077,  $p = .0267$ ). This supports proposition 7. Option 2 was chosen by 1/8 (12.5%) of respondents under the DAS condition, 3/11 (27.3%) under the base condition, and 1/12 (8.3%) under the IPS condition. The distribution was not significant, but was in the direction suggested by proposition 8. Option 3 was chosen by 4/8 (50%) of respondents under the DAS condition, 6/11 (54.5%) under the base condition, and 3/12 (25.0%) under the IPS condition. Once again we find this proposition has no support.

For the decisions under uncertainty the results differ more from those of the whole sample than they did for the intertemporal decisions, but there are no reversals in the relationships. Proposition 10 suggests that option 1 would be chosen by a larger proportion under the DAS condition than the base condition, and that is indeed the case. Option 1 was chosen by 11/13 (84.6%) under the DAS condition and 6/10 (60.0%) under the base condition. The logistic regression model is not significant. Option 2 was only chosen by one respondent out of 37, but it was a respondent under the IPS condition as expected. No respondents under the base or DAS condition chose option 2. Option 3 was chosen by 2/13 (15.4%) of respondents under the DAS condition, 3/14 (21.4%) under the IPS condition, and 4/10 (40.0%) under the base condition. As expected, respondents moved away from this option whenever the money or probability dimensions were made more salient.

### **Discussion and Implications**

The presence of some highly significant differences in the distribution of respondent choices, and the fact that the predominant pattern of the distribution of choices was in the direction suggested by the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity models, are encouraging in spite of the empirical results not giving definitive support to our propositions. Given that respondents did not consistently choose the option favored by the case discussion, it appears that some portion of the respondents



in each decision exercise were affected by the common additive or common proportional adjustments to the dollar value of the options and either increased or decreased the importance they gave the dollar value dimension relative to the other dimensions. In a more classical experimental setting, with equally valued prospects and a simpler problem scenario, it would be right to expect stronger results. In this case, considering the exercise involved a complex and realistic decision scenario, it could be argued that weaker results are more tolerable. It is possible, in fact, that our results are an accurate representation of how the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects are actually manifested in marketing decisions.

If marketing decisions all involved well-defined and easy to evaluate prospects, they would be easy to automate, and optimization would be an easily achievable objective. It is more realistic to think, however, that marketing managers encounter situations in which the value of prospects is hard to assess, and that options are made unequally attractive by hard-to-quantify factors. It is also more realistic to think that marketing managers make decisions with incomplete and sometimes ambiguous information. It is possible, therefore, that the inconsistent application of decision rules (be they heuristics or more formal evaluation procedures) we see in our results is an accurate representation of the intermingling of these various decision strategies by managers. In response to their environment, marketing managers sometimes make decisions on the basis of factual information while at other times rely on heuristic evaluation schemes. This suggests the application of decision heuristics might be affected by context in a way similar to how the use of risk averse and risk taking strategies is affected by the framing of prospects. This study, unfortunately, does not give us insight into what variables might systematically affect susceptibility to Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects. This we leave as an opportunity for future research.

Another area for which our results have some implications is for group decision making in marketing organizations as a safeguard against errors in judgment. When respondents were asked to make the second choice, they had all spent time reviewing the case and designing a strategy as a group, and all should have preferred the option that introduced the product in the US in September and in Europe in February for strategic reasons beyond the income streams as presented. It appears, however, that even decisions developed in group discussion are susceptible to Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects. We collected information on group cohesiveness and attitude toward the task (Glazer, Steckel and Winer 1987), but found no difference in these variables between those susceptible to the effects and those not susceptible. We compared these groups also on their age, work experience, GMAT scores, and gender distribution and found no discernible differences on these variables either. Keeping in mind that it was not the same people being susceptible to the effects in the first and second exercises, we were in effect looking for distinguishing characteristics between four different groups and found none.

If, indeed, the Decreasing Absolute Sensitivity and Increasing Proportional Sensitivity effects are caused by the application of heuristics which is affected by dispositional or environmental factors, it might be hard to control their application and to adopt a managerial style that reduces the types of errors they might produce. The application of these heuristics might even be sub-conscious and motivated by how different environmental information is processed and the images it evokes. It might be, for example, that the Time Valuation Model (Mowen and Mowen 1991), which introduces time as a third dimension along which gain and loss prospects are evaluated, is not really a static three dimensional surface, but shifts its slope in response to other factors. The Time Valuation Model made the surface static and moved the decision point, but a more

accurate representation might be that the decision point is static and the evaluation surface is dynamic. More research on the circumstances in which these heuristics are applied and not applied is necessary to better understand them and systematically address their use in marketing decision making.

**TABLE 1**  
**SAMPLE OPTION MANIPULATIONS**  
**OPTION 1: FIRST DECISION EXERCISE IN ALL CONDITIONS**

Intertemporal Decision - Base Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features.  
Revenue from US sales of \$1,170,000 starting in September and from international sales of \$429,600 starting in October.

US	Intl.					
\$1,170.0	\$429.6					
+-----+-----+-----+-----+-----+						
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	

Intertemporal Decision - DAS Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features.  
Revenue from US sales of \$6,170,000 starting in September and from international sales of \$5,429,600 starting in October.

US	Intl.					
\$6,170.0	\$5,429.6					
+-----+-----+-----+-----+-----+						
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	

Intertemporal Decision - IPS Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features.  
Revenue from US sales of \$11,700,000 starting in September and from international sales of \$4,296,000 starting in October.

US	Intl.					
\$11,700.0	\$4,296.0					
+-----+-----+-----+-----+-----+						
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	

Decision Under Uncertainty - Base Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features.  
Revenue from the US market of \$950,000 with .85 probability (.15 probability of \$0 revenue) and \$529,800 from other markets with .50 probability (.50 probability of \$0 revenue).

Decision Under Uncertainty - DAS Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features.  
Revenue from the US market of \$5,950,000 with .85 probability (.15 probability of \$0 revenue) and \$5,529,800 from other markets with .50 probability (.50 probability of \$0 revenue).

Decision Under Uncertainty - IPS Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features.  
Revenue from the US market of \$9,500,000 with .85 probability (.15 probability of \$0 revenue) and \$5,298,000 from other markets with .50 probability (.50 probability of \$0 revenue).

**TABLE 2**  
**PROPORTION OF RESPONDENTS CHOOSING EACH OPTION**  
**UNDER THE BASE, DAS, AND IPS CONDITIONS**  
**FOR FIRST AND SECOND DECISION EXERCISE**

**Intertemporal Decisions - First Exercise**

<u>Condition</u>	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>
Base	4/19 (21.1)	10/19 (52.6)	5/19 (26.3)
DAS	7/19 (36.8)	9/19 (47.4)	3/19 (15.8)
IPS	4/19 (21.1)	12/19 (63.2)	3/19 (15.8)
Logistic Regression			
Model chi-square	1.580	.998	.870
(Significance)	(.4538)	(.6073)	(.6472)

**Decisions Under Uncertainty - First Exercise**

<u>Condition</u>	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>
Base	6/19 (31.6)	8/19 (42.1)	5/19 (26.3)
DAS	3/19 (15.8)	15/19 (78.9) <sup>a</sup>	1/19 (5.3)
IPS	5/19 (26.3)	11/19 (57.3)	3/19 (15.8)
Logistic Regression			
Model chi-square	1.377	5.598	3.412
(Significance)	(.5023)	(.0609)	(.1816)

**Intertemporal Decisions - Second Exercise**

<u>Condition</u>	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>
Base	7/19 (36.8)	4/19 (21.1)	8/19 (42.1)
DAS	8/19 (42.1)	3/19 (15.8)	8/19 (42.1)
IPS	14/19 (73.7) <sup>b</sup>	2/19 (10.5)	3/19 (15.8)
Logistic Regression			
Model chi-square	6.379	.892	6.377
Significance	(.0946)	(.8275)	(.0946)

**Decisions Under Uncertainty - Second Exercise**

<u>Condition</u>	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>
Base	11/19 (57.9)	0/19 (0.0)	8/19 (42.1)
DAS	12/19 (63.2)	1/19 (5.3)	6/19 (31.6)
IPS	13/19 (68.4)	2/19 (10.5)	4/19 (21.1)
Logistic Regression			
Model chi-square	2.627	3.284	2.309
Significance	(.4527)	(.3498)	(.5109)

<sup>a</sup>: Odds of option 2 under the DAS condition were 5.2 times greater than the odds under the base condition (Wald statistic = 5.0514, p = .0246).

<sup>b</sup>: Odds of option 1 under the IPS condition were 4.7 times greater than the odds under the base condition (Wald statistic = 4.8008, p = .0284)



**TABLE 3**  
**PROPORTION OF RESPONDENTS CHOOSING EACH OPTION**  
**FOR SECOND DECISION EXCLUDING RESPONDENTS**  
**WITH SAME CONDITION FOR BOTH EXERCISES**

**Intertemporal Decisions - Second Exercise**

<u>Condition</u>	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>
Base	6/10 (60.0)	0/10 (0.0)	4/10 (40.0)
DAS	11/13 (84.6)	0/13 (0.0)	2/13 (15.4)
IPS	10/14 (71.4)	1/14 (7.1)	3/14 (21.4)
Logistic Regression			
Model chi-square	2.754	2.492	2.906
Significance	.4311	.4767	.4064

**Decisions Under Uncertainty - Second Exercise**

<u>Condition</u>	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>
Base	2/11 (18.2)	3/11 (27.3)	6/11 (54.5)
DAS	3/8 (37.5)	1/8 (12.5)	4/8 (50.0)
IPS	8/12 (66.7) <sup>a</sup>	1/12 (8.3)	3/12 (25.0)
Logistic Regression			
Model chi-square	5.896	1.892	4.752
Significance	.1168	.5952	.1909

---

<sup>a</sup>: Odds of option 1 under the IPS condition were 9.1 times greater than the odds under the base condition (Wald statistic = 4.9077,  $p = .0267$ )

## APPENDIX

### Intertemporal Base Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features. Revenue from US sales of \$1,170,000 starting in September and from international sales of \$429,600 starting in October.

US	Intl.				
\$1,170.0	\$429.6				
+-----+-----+-----+-----+-----+					
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

**Option 2:** Introduce Works in the US in September without new features and in Europe the following February with new features. Revenue from US sales of \$1,170,000 starting in September and from international sales of \$504,800 starting in February.

US					Intl.
\$1,170.0					\$504.8
+-----+-----+-----+-----+-----+					
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

**Option 3:** Introduce Works in the US in November and in Europe in December with new features. Revenue from US sales of \$735,000 starting in November and from international sales of \$804,800 starting in December.

		US	Intl.		
		\$735.0	\$804.8		
+-----+-----+-----+-----+-----+					
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

### Intertemporal DAS Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features. Revenue from US sales of \$6,170,000 starting in September and from international sales of \$5,429,600 starting in October.

US	Intl.				
\$6,170.0	\$5,429.6				
+-----+-----+-----+-----+-----+					
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

**Option 2:** Introduce Works in the US in September without new features and in Europe the following February with new features. Revenue from US sales of \$6,170,000 starting in September and from international sales of \$5,504,800 starting in February.

US					Intl.
\$6,170.0					\$5,504.8
+-----+-----+-----+-----+-----+					
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

**Option 3:** Introduce Works in the US in November and in Europe in December with new features. Revenue from US sales of \$5,735,000 starting in November and from international sales of \$5,804,800 starting in December.

		US	Intl.		
		\$5,735.0	\$5,804.8		
+-----+-----+-----+-----+-----+					
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

### Intertemporal IPS Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features. Revenue from US sales of \$11,700,000 starting in September and from international sales of \$4,296,000 starting in October.

US	Intl.				
\$11,700.0	\$4,296.0				
+-----+-----+-----+-----+-----+					
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

**Option 2:** Introduce Works in the US in September without new features and in Europe the following February with new features. Revenue from US sales of \$11,700,000 starting in September and from international sales of \$5,048,000 starting in February.

US					Intl.
\$11,700.0					\$5,048.0
+-----+-----+-----+-----+-----+					
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

**Option 3:** Introduce Works in the US in November and in Europe in December with new features. Revenue from US sales of \$7,350,000 starting in November and from international sales of \$8,048,000 starting in December.

		US	Intl.		
		\$7,350.0	\$8,048.0		
+-----+-----+-----+-----+-----+					
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.

### Decision Under Uncertainty Base Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features. Revenue from the US market of \$950,000 with .85 probability (.15 probability of \$0 revenue) and \$529,800 from other markets with .50 probability (.50 probability of \$0 revenue).

**Option 2:** Introduce Works in the US in September without new features and in Europe the following February with new features. Revenue from the US market of \$850,000 with .75 probability (.25 probability of \$0 revenue) and \$724,833 from other markets with .60 probability (.40 probability of \$0 revenue).

**Option 3:** Introduce Works in the US in November and in Europe in December with new features. Revenue from the US market of \$850,000 with .55 probability (.45 probability of \$0 revenue) and \$756,125 from other markets with .80 probability (.20 probability of \$0 revenue).

### Decision Under Uncertainty DAS Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features. Revenue from the US market of \$5,950,000 with .85 probability (.15 probability of \$0 revenue) and \$5,529,800 from other markets with .50 probability (.50 probability of \$0 revenue).

**Option 2:** Introduce Works in the US in September without new features and in Europe the following February with new features. Revenue from the US market of \$5,850,000 with .75 probability (.25 probability of \$0 revenue) and \$5,724,833 from other markets with .60 probability (.40 probability of \$0 revenue).

**Option 3:** Introduce Works in the US in November and in Europe in December with new features. Revenue from the US market of \$5,850,000 with .55 probability (.45 probability of \$0 revenue) and \$5,756,125 from other markets with .80 probability (.20 probability of \$0 revenue).

### Decision Under Uncertainty IPS Condition

**Option 1:** Introduce Works in the US in September and in Europe in October without new features. Revenue from the US market of \$9,500,000 with .85 probability (.15 probability of \$0 revenue) and \$5,298,000 from other markets with .50 probability (.50 probability of \$0 revenue).

**Option 2:** Introduce Works in the US in September without new features and in Europe the following February with new features. Revenue from the US market of \$8,500,000 with .75 probability (.25 probability of \$0 revenue) and \$7,248,330 from other markets with .60 probability (.40 probability of \$0 revenue).

**Option 3:** Introduce Works in the US in November and in Europe in December with new features. Revenue from the US market of \$8,500,000 with .55 probability (.45 probability of \$0 revenue) and \$7,561,250 from other markets with .80 probability (.20 probability of \$0 revenue).



## References

- Benzion, Uri, Ammon Rapoport, and Joseph Yagil (1989), "Discount Rates Inferred from Decisions: An Experimental Study," *Management Science*, 35 (March), 270-284
- Cosse, Thomas J. and John E. Swan (1983), "Strategic Marketing Planning by Product Managers - Room for Improvement?" *Journal of Marketing*, 47 (Summer), 92-102
- Day, George S. and Liam Fahey (1988), "Valuing Market Strategies," *Journal of Marketing*, 52 (July), 45-57
- Glazer, Rashi, Joel H. Steckel, and Russell S. Winer (1987), "Group Process and Decision Performance in a Simulated Marketing Environment," *Journal of Business Research*, 15 (40), 545-557
- Harvard Business School (1987), *Microsoft Corporation: The Introduction of Microsoft Works*, Boston, MA: President and Fellows of Harvard College, case no. 9-588-028
- Kahneman, Daniel and Amos Tversky (1979), "Prospect Theory, An Analysis of Decisions Under Risk," *Econometrica*, 42 (2), 363-391
- Koopmans, T. (1960), "Stationary Ordinal Utility and Impatience," *Econometrica*, 18, 207-309
- Lowenstein, George and Drazen Prelec (1992), "Anomalies in Intertemporal Choice: Evidence and an Interpretation," in *Choice Over Time*, George Lowenstein and Jon Eister, eds. New York: Russel Sage Foundation, 119-145

Mowen, John C. and Maryanne M. Mowen (1991), "Time and Outcome Valuation: Implications for Marketing Decision Making," *Journal of Marketing*, 55 (October), 54-62

von Neumann, John and Oscar Morgenstern (1953), *Theory of Games and Economic Behavior*, Princeton, NJ: Princeton University Press

Prelec, Drazen and George Lowenstein, (1991), "Decision Making Over Time and Under Uncertainty: A Common Approach," *Management Science*, 37 (July), 770-786

Puto, Christopher (1987), "The Framing of Buying Decisions," *Journal of Consumer Research*, 14 (December), 301-315

Qualls, William J. and Christopher P. Puto (1989), "Organizational Climate and Decision Framing: An Integrated Approach to Analyzing Industrial Buying Decision," *Journal of Marketing Research*, 26 (May), 179-192

Weber, M. and C. F. Cramer (1988), "Recent Developments in Modeling Preferences Under Risk," *OR Spectrum*, 9, 129-151

Wilson, Lynn O., Allen M. Weiss, and George John (1990), "Unbundling of Industrial Systems," *Journal of Marketing Research*, 27 (May), 123-138











HECKMAN  
BINDERY INC.

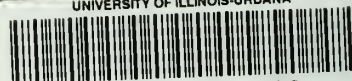


**JUN 95**

Bound-To-Please® N. MANCHESTER,  
INDIANA 46962



UNIVERSITY OF ILLINOIS-URBANA



3 0112 060295836